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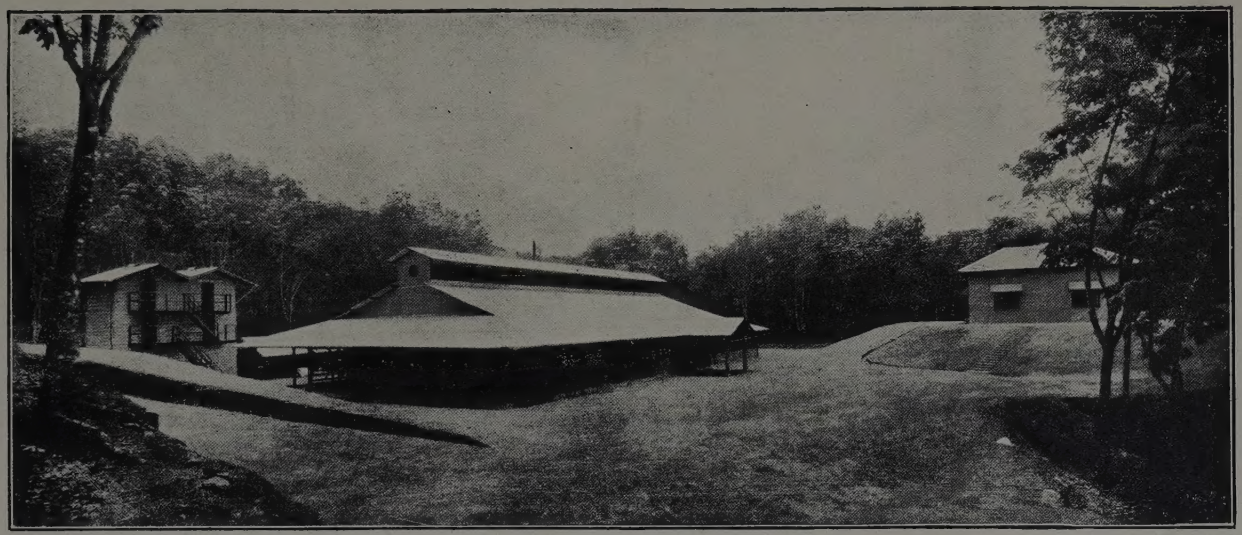

THE LABORATORY AND EXPERIMENTAL FACTORY AT DARTONFIELD ESTATE

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OIDIUM LEAF DISEASE IN CEYLON IN 1935

R. K. S. MURRAY, A. R. C. Sc.,
BOTANIST AND MYCOLOGIST

FOREWORD

IN a report published under a similar caption in the *Second Quarterly Circular* for 1934, the status of Oidium in Ceylon was reviewed and probable future developments discussed. The conclusion was reached that at mid-country elevations the disease was causing sufficient damage to have an adverse effect on estate crops, and that in the absence of control measures a permanent improvement in the position was improbable. In the low-country, on the other hand, there was as yet no definite evidence that Oidium was causing declines in yield, but although it was difficult to forecast the future course of the disease with assurance there were indications of increasing incidence. Recommendations for the adoption of control measures in 1935 were based on the above considerations *i.e.*, sulphur dusting was regarded as an essential measure for mid-country estates, but in the low-country it was suggested that the trend of future developments might safely be awaited before embarking on the treatment. It is now necessary to consider in what respects a study of the recent season's attack has caused any modification of these views.

INCIDENCE OF OIDIUM IN 1935

It will be recalled that attacks of unprecendented severity were experienced in all districts during the refoliation season of 1934, the phenomenon being attributed by some to unusually wet weather and by others to an independent advance on the part of the fungus. Observations on the course of the disease during 1935 were awaited with great interest inasmuch as they might be expected to shed some light on the future status of Oidium, particularly in the low-country. Unfortunately, from this point of view, the weather conditions during and immediately preceding the 1935 refoliation were as abnormally dry as those

in 1934 were abnormally wet, and the course of refoliation was not representative of an average year. Certain conclusions nevertheless emerge from the writer's observations in various districts.

For the purpose of studying the incidence of Oidium in Ceylon it is convenient to classify the Rubber areas into three zones of elevation.

There is, in the first place, the high grown Rubber at elevations of about 2,000 ft. These areas have suffered as severely during the recent refoliation as in any previous year, and it may be concluded that effective control of the disease is essential for the continued economic existence of the trees.

The next zone is what may be termed low mid-country Rubber *i.e.*, areas at elevations of between 1,000 and 1,500 ft as typified by the lower-lying estates in the Matale Valley. Many of the districts in this category suffered very severely from the 1934 drought, as the result of which an abnormal "winter" of a large proportion of trees occurred in August and September. The consequence was an exceptionally irregular "winter" this year, some trees shedding their leaves normally and others retaining them. Those areas which refoliated during January and February escaped with a relatively mild attack owing to the exceptionally hot, dry weather prevailing at that time, but later wintering estates suffered defoliation comparable with that experienced last year. Although the damage, in general, was less than in 1934, even on undusted properties, the recommendation to adopt the sulphur dusting treatment at this zone of elevation remains unaltered; it is, indeed, confirmed by the striking contrasts between dusted and undusted areas which are evident as the result of this year's operations.

The third zone comprises the main low-country districts. The writer is only able to refer in detail to this year's attack in the Kalutara District, but the following remarks are probably applicable in general to other localities. Owing to the abnormally hot, dry weather experienced in December and January the winter was exceptionally early. Oidium was first observed towards the end of January, but it appeared that the high temperatures and low humidity were unfavourable for the activities of the fungus, and for some weeks the damage was negligible. On the advent of rains in the middle of February, however, there

was a rapid increase in the incidence of the disease, and late wintering trees suffered considerable defoliation although the weather again became hot and dry. A feature, indeed, of this year's attack was the heavy leaf-fall of such trees, despite weather conditions differing greatly from those experienced in 1934. In general, the nett amount of damage was less than last year owing to the fact that the majority of the trees had mature or almost mature foliage before the outbreak, but it seems difficult to avoid the conclusion that had the winter been later, or the February rains occurred earlier, a substantial proportion of the trees would have suffered defoliation. The opinion that Oidium is unlikely to revert to its former position of comparative unimportance is therefore confirmed, at least as far as certain low-country localities are concerned.

UNDER WHAT CIRCUMSTANCES SHOULD SULPHUR DUSTING BE UNDERTAKEN?

The urgent need for effective control measures in mid-country districts, where Oidium is clearly exercising an adverse effect on bark renewal and yield, is abundantly evident, and the successful outcome of sulphur dusting operations undertaken this year on a large number of estates leaves no doubt as to the means by which this control can be achieved. At the highest elevations, however, where severe abnormal defoliation has been experienced for a number of years, the economic advisability of incurring the necessary expenditure is sometimes doubtful. On some estates bark has been conserved by the cessation of tapping during the years of depression, but on others the damage caused by continued tapping in the absence of normal bark renewal is so great as to be almost irreparable. In the latter instances sulphur dusting would need to be accompanied by a generous programme of rest and cultivation before the trees could again be tapped profitably, and it is for those responsible for the management of each individual estate to decide whether the Rubber area is worthy of preservation at this cost.

In the low-country the issue is less clearly defined. Although recent decreases in yield and rate of bark renewal have been commonly attributed to Oidium, it is difficult to give due weight to the various factors involved in the absence of controlled field experiments conducted over a considerable period of time. At

present it is only possible to argue on general considerations that if foliage is materially depleted bark renewal must suffer, and that any circumstance which is detrimental to bark renewal must ultimately be detrimental also to yield. The normal rate of renewal on the average Ceylon estate does not allow sufficient margin over consumption for any adverse factor to be viewed with anything but concern.

Turning from the realm of theory to the safer ground of actual field observations, the results of dusting operations undertaken on a number of estates in the low-country this year enable the damage caused to the overhead canopy by Oidium (as compared with unfavourable soil conditions) to be fairly assessed. Apart from the prevention of leaf-fall the most striking feature of the dusted foliage, in contrast with neighbouring untreated areas, is the large size of the leaf and the almost complete absence of the spotted, distorted and under-sized leaflets so characteristic of badly affected areas. It is clear, indeed, that the effect of Oidium in reducing leaf size (and therefore the total leaf area) has, in the past, been underestimated, the phenomenon of a gradually thinning foliage being attributed, often incorrectly, to lack of cultivation. It should not, of course, be inferred that Oidium is in all cases the cause of deterioration in foliage, but there is no doubt that the incidence of the disease has often been judged by the extent of leaf-fall only, insufficient notice being taken of the condition of the leaves remaining on the trees. The ultimate economic significance of this manifestation of Oidium is at present only a matter for intelligent argument, but it can at least be averred that the functions of bark renewal and yield are dependent on the foliage, and that there must come a point where the reduction in efficient leaf area is a matter of economic importance.

The figures given below illustrate the benefit of sulphur dusting a block of 100 acres in the Kalutara District during the 1935 refoliation season. Of this 100 acres, 50 were manured with a general mixture in September-October 1934. The areas which served as a control consist of 40 acres which were manured but not dusted, and 73 acres which were neither manured nor dusted. An estimate of the incidence of Oidium in the various blocks was made by examining the foliage of 100 trees in each

block in 10 groups of 10 trees each selected at random. The foliage was classified under the following headings:—

A. Leaves healthy or slightly spotted.

B. Leaves spotted and malformed.

C. Trees appreciably defoliated.

The figures represent percentages.

Classification	A	B	C
Block			
Dusted and Manured	88	11	1
Dusted only	92	7	1
Manured only	19	47	34
Neither	35	41	24

General observations confirmed the above figures; the dusted fields, whether manured or not, bore the heaviest overhead canopy seen in the vicinity for some years, the foliage of the undusted areas being very sparse by comparison. These striking results were achieved at the cost of Rs. 3·54 per acre (excluding the cost of machine), and there can be no doubt that the expense was fully justified.

Certain secondary benefits resulting from a good canopy are worthy of mention. The soil is shaded and kept cool, and undesirable growths such as grass, bracken and stag-moss, which only flourish in well-lighted situations, are largely suppressed.

In the light of the considerations discussed above a more definite policy for the low-country than that advocated in 1934 seems justified, and the sulphur dusting treatment is now recommended in the more severely affected low-country localities. In R R.S. Leaflet No. 15, which was issued to give preliminary recommendations for 1936, the suggestion was made that on estates which have not hitherto experienced a bad attack, but on which the disease appears to be on the increase, the application of very small quantities of sulphur might prove a wise form of insurance against more extensive damage in the future.

Experience in the Kalutara District since the issue of the leaflet shows, however, that almost complete control of Oidium introduces a danger of severe Phytophthora leaf-fall during the succeeding South-West Monsoon, and a mild attack of Oidium may actually serve a useful purpose in districts which normally experience a wet monsoon. The suggestion of dusting mildly affected areas needs, therefore, to be reconsidered, and it would probably be wise to restrict operations to those estates on which Oidium is causing marked deterioration of the overhead canopy.

The connection between Oidium and Phytophthora needs further explanation.

OIDIUM AND PHYTOPHTHORA

It is well known that the inflorescence is highly susceptible to Oidium attack, and severely affected areas are consequently characterised by a scarcity or entire absence of seed. Now the development of Phytophthora, the fungus which causes the disease usually known as "secondary leaf-fall", is largely dependent on the existence of pods, these acting as the main centres of infection. It therefore follows that the greater the incidence of Oidium the less is the likelihood of Phytopthora leaf-fall during the following monsoon, and *vice versa*.

The possibility that sulphur dusting would lead to an increase in the incidence of Phytophthora has always been recognised, but until 1935 dusting operations were restricted to mid-country elevations where the degree of control, although satisfactory in maintaining a fair foliage, has generally been insufficient to protect the flower, and where, furthermore, Phytophthora is of less importance than in the wetter low-country districts. This year, however, dusting was carried out on a number of low-country estates, and Oidium was so completely controlled that a sharp attack of Phytophthora was experienced in June and early July. The disease was also in evidence in non-dusted areas but to a much smaller extent. This attack was not unexpected but was more severe than had been anticipated. In the first place it had been supposed that on account of the low incidence of Phytophthora in recent years there would be insufficient infective material to lead to a severe attack, and in the second place the weather conditions were particularly favourable for the development of the fungus. These conditions were:

(1) Settled fine weather during the flowering period so that a relatively large proportion of the female flowers set seed. It is generally agreed that the trees in dusted areas have borne an unusually heavy crop of pods even in comparison with the years before the advent of Oidium, so that the stage was set for a severe attack if the second condition was fulfilled.

(2) Continued wet weather during the ripening of the pods. In the Kalutara District, to which the writer's observations have been confined, the weather was continuously wet during May and June. Records at these laboratories show that although the actual intensity of rainfall was below normal, only four dry days occurred between the 8th May and the 5th July. It is not suggested that wet weather during these months is abnormal, but it is usual for the critical period, *i.e.*, the ripening of the pods, to occur in July rather than in June. The wintering, flowering and seed seasons have been unusually early this year.

At the time of writing a dry spell has intervened and the disease has been checked, and it seems fair at this stage to review the damage caused. With the exception of individual trees and small patches of very limited extent, the foliage of dusted areas remains, in most cases, superior to that of adjacent untreated fields. The number of leaves remaining on the trees is probably no greater, and may even be less, than in areas on which Oidium was uncontrolled, but the leaves are bigger and healthier and the canopy denser.

After the most careful observations, therefore, of the effect of Phytophthora in dusted areas in a season favourable for this disease but not for Oidium, the conclusion is reached that there is so far no reason to rescind the recommendation to dust on the more severely affected low-country estates, though it may be desirable to modify the programme so that the control of Oidium is less complete. The advisability of dusting more lightly affected areas as suggested in R.R.S. Leaflet No. 15 is, however, open to question. The possibility of more severe attacks of Phytophthora being experienced as the result of an increase in the quantity of infective material carried over from year to year must not be overlooked, but this danger can only be assessed in the light of future experience.

The consideration of means of controlling Phytophthora would be outside the scope of this report, but the matter is

receiving the close attention of the Rubber Research Scheme. In the meantime the safest course to follow in wet low-country districts is to endeavour to compromise between the two diseases. Hitherto the aim has been to achieve the most complete control of Oidium possible, but it may be preferable to allow the fungus scope for attacking the flower while preventing most of the damage to the young foliage. To what extent this will be possible by reducing the quantities of sulphur used or, alternatively, by increasing the period between applications, must be determined by field experience, but the idea of a compromise receives support from the observation that the boundaries of dusted and undusted areas have remained relatively free from both Oidium and Phytophthora. The suggestion now made is that the quantity of sulphur used for each application be reduced by about a third, (to about 4 lb. per acre) the interval between successive rounds remaining at about 7 days.

It must be made clear that the above remarks do not apply to high elevations, where control is unlikely to be so complete as to permit the setting of much seed, or to districts in which a wet monsoon is not normally experienced.

MANURING AND OIDIUM

At various times and in various quarters the suggestion has been made that the resumption of manuring programmes will solve the problem of Oidium control, and this opportunity is taken of dispelling this illusion. It is doubtless true that properties which have always been maintained in a high state of cultivation have suffered less damage and can better afford to lose a measure of foliar efficiency than their less fortunate neighbours; that, however, is not the point at issue. The problem is to control Oidium in areas where it has already obtained a strong foothold. The figures given in the preceding section show that one application of manure (costing Rs. 30/- per acre) has been of no value in checking the activities of the fungus, the disease, in fact, having caused greater damage in the manured than in the unmanured area. Stress should not be laid on the latter point owing to the non-replicated nature of the comparison, but it is nevertheless clear that there is a real danger in manuring without sulphur dusting owing to the postponement of the refoliation process into the time at which Oidium is most active.

It should not be inferred that the application of artificial fertilisers is not needed on many estates at the present time. That is a subject apart. Just as there are estates on which sulphur dusting is the primary need, so are there estates on which cultivation is urgently required. The point for consideration on each individual estate is whether soil conditions or Oidium is the limiting factor in the development of the foliage. If the latter, sulphur dusting must take first place in any ameliorative programme and manuring may be considered as a complementary measure; if the former, it is first necessary to restore the fertility of the soil and control of Oidium can be undertaken if and when considered advisable.

THE CONTROL OF OIDIUM*

R. K. S. MURRAY, A.R.C. Sc.,
BOTANIST AND MYCOLOGIST.

THE last occasion on which I had the privilege of addressing the Matale Planters' Association on the subject of the sulphur dusting treatment for Oidium was in January 1932. At that time the disease although probably ubiquitous, was only causing serious damage at the higher elevations, and owing to the depressed state of the Rubber market the interest in sulphur dusting was, I feel, largely academic. As you are all aware the last two or three years have witnessed an extension of severe attacks to lower levels, and although the defoliation in the Matale Valley is still—and will, I hope, always remain—far less than at 2,000 ft., it has been considered sufficiently serious, in conjunction with the improved price for the commodity, to justify the cost of extensive dusting operations. Whereas on the former occasion I was addressing a body of planters who, with few exceptions, had had no experience of sulphur dusting, and was therefore in the happy position of being able to speak with little fear of contradiction, I have now to meet you, so to speak, on your own ground. Many of you have dusted more acres and inhaled more sulphur than I have done, and I have come here in the hope, not only of helping you by what I may say, but also of taking away a few hints from your practical experience. The way I intend to treat the subject today is to consider what are the lessons to be learned from this season's work, and I hope that my remarks will merely be the prelude to a general discussion on what, for this district at any rate, is a very important topic.

ADVISABILITY OF SULPHUR DUSTING

Before dealing with practical aspects of sulphur dusting I want to consider briefly the circumstances under which the treatment should be undertaken, and I hope to convince those of

* Lecture given to the Matale Planters' Association on April 17, 1934.

you who still have an open mind on the subject that sulphur dusting is a practicable and economically desirable measure on most, if not all, estates in this district.

The two arguments that I have most commonly heard advanced against sulphur dusting any particular property are:

(1) that it is unnecessary, and

(2) that it is ineffective unless the treatment is also undertaken on neighbouring estates.

The necessity for sulphur dusting is, of course, primarily dependent on the damage caused by the disease. At the higher elevations, where Oidium causes perpetual defoliation almost throughout the year, the need for effective control if the foliage, bark renewal and yield are to be maintained at a normal level will, I think, be readily conceded. The only doubt in such cases is whether the damage already done during the past few years is not almost irreparable. In the course of visiting many mid-country estates I have sometimes questioned the economic advisability of carrying out sulphur dusting in the worst areas unless the treatment is to be accompanied by a generous programme of cultivation and rest, and it is for the individual estate to decide whether its Rubber area is worthy of preservation at this cost.

At the lower levels, where the high temperatures are less favourable for the fungus and more favourable for the host, the incidence of Oidium in any particular year is more markedly dependent on the weather conditions during and immediately preceding the period of refoliation, and we may therefore expect greater annual fluctuations than up in the hills. The last two seasons, 1934 and 1935, have provided the widest contrast in weather conditions. The early months of 1934 were characterised by cool wet weather, and the year will always be remembered as the first in which severe and wide-spread defoliation occurred in the Matale Valley. This year the damage has been appreciably less, even in undusted areas, and this can doubtless be attributed to the abnormally hot dry weather experienced during the latter half of 1934 and the early weeks of 1935.

Although any attempt to cast a prophetic eye into the future is always a somewhat hazardous proceeding, it seems reasonable to assume that the weather conditions, and therefore the incidence of Oidium, will vary between these two opposite

extremes. I have not had the opportunity of inspecting many untreated estates in the Matale Valley recently, but the few contrasts I have seen leave no doubt in my mind that even this year the foliage of dusted areas has benefited very materially from the treatment. The ultimate criterion of the value of any treatment must always be yield per acre and the only definite experimental evidence of serious decreases in yield due to Oidium is derived from Rubber at an elevation of about 2,000 ft., but we can reasonably argue from general considerations that a depleted foliage must result in a decreased rate of bark renewal, and that any circumstance which is detrimental to bark renewal must ultimately be detrimental also to yield. It seems probable, also, that Oidium must be held partly responsible for the large increase in the incidence of Brown Bast in this district.

My conclusion, therefore, is that in the absence of control measures there is little likelihood of Oidium reverting to its former position of comparative unimportance, and that sulphur dusting may be regarded as at least a wise form of insurance against extensive damage in the future. I will refer later to the question of costs but may here say, with, I think, little fear of being controverted, that the improvement in the foliage resulting from an expenditure of Rs. 4/- or Rs. 5/- per acre on sulphur dusting would be regarded as most gratifying if it resulted from manuring at a cost of Rs. 30/- per acre.

The second argument against the adoption of sulphur dusting is that it is ineffective unless the treatment is universally carried out. This contention seems largely based on the misconception that sulphur dusting is a method by means of which Oidium could be entirely eradicated were it not for the influx of wind-borne spores from neighbouring untreated areas, and is, moreover, an entirely hypothetical argument unsupported by facts. Those of you who have seen contiguous dusted and undusted fields will have noticed that the deleterious influence is usually restricted to quite a narrow strip and that it is possible to define the boundary to within a few yards. This is clearly shown in the two photographs* numbered 7 and 8. I do not wish to be understood to suggest that co-operative dusting in a badly affected district is not highly desirable, but the fact that Oidium remains uncontrolled on neighbouring properties is not a cogent argument against undertaking the treatment.

* Not reproduced.

In these remarks I have taken the efficacy of sulphur dusting under normally favourable weather conditions for granted, an attitude that is, I think, justified by the results obtained this year on many estates in this and other districts. If any of you have dusted without achieving satisfactory control I hope you will mention your experiences, as I feel sure that a satisfactory explanation will be forthcoming. I may say that I have this year seen very striking control at all elevations from over 2,000 ft. to sea level. It seems almost unnecessary in this district to illustrate the effects of dusting by means of photographs, but in case any of you have not had the opportunity of comparing neighbouring dusted and undusted areas I have a few photographs here for circulation.

There is one further point regarding the visible results of dusting which calls for comment. As you are aware a tree defoliated by Oidium produces fresh shoots and leaves a few weeks after the leaf-fall. This second crown may also be attacked and a third crop produced, and so on. Ultimately the leaves remain on the tree owing to the cessation of the activities of the fungus. During the latter half of the year, therefore, the foliage of an undusted area may compare favourably in general appearance with that of a dusted area, and the benefit of the treatment is easily overlooked. It must be remembered that although the undusted foliage may thus function satisfactorily for 6 or 9 months of the year, the recovery has been at the expense of food reserves which are required for the processes of latex production and bark renewal.

EQUIPMENT

Machines.—I have been privileged to see the final reports of this season's operations on a number of estates, and there seems to be considerable diversity of experience with the various types of machines in use, and even with different units of the same make. Whereas some Superintendents have reported entirely satisfactory working, others have had their programmes considerably upset by mechanical breakdowns. In some cases the trouble appears to have resulted from definite defects in design or workmanship, though I suspect that sometimes the engine has been driven rather too hard. I think it will be generally agreed that there is greater room for improvement in the dusting outfits than in any other aspect of the treatment, and I am sure that suggestions will be valued by the manufacturers.

I have myself forwarded many suggestions at different times and have emphasised the fact that faulty construction of one part may entirely dislocate the season's programme. A matter which, I hope, will engage the attention of our Colombo friends is the importance of the local Agents carrying an adequate stock of spare parts.

Sulphur.—As regards sulphur, I do not intend publicly to discuss the respective merits of rival brands, but I may say that I have heard no unsatisfactory reports this year.

TECHNIQUE

Turning to the field technique of dusting, the point that has struck me more than any other in recent conversation with Superintendents is that many of the practical difficulties which were anticipated before work was commenced have not, in actual fact, been experienced or have not, at least, proved insuperable. There may be exceptions, but there is no doubt that even the steepest land can be satisfactorily dealt with if there is an adequate system of roads and paths along which the machine can be wheeled or carried. I consider the provision of such a system to be an important contribution to the improvement of the dusting technique on hilly land, not so much from the point of view of ultimate reduction in costs as enabling a larger area to be treated in a day, thus relieving the Superintendent of many hours of supervisory work. A word of warning in this connection must, however, be given. If the machine is being carried there is little likelihood of the engine becoming overheated owing to the necessity of giving the labourers, and therefore the machine, frequent rest, but if placed on wheels there are no such compulsory stoppages and there is a temptation to run the engine at full speed for too long a stretch with consequent overheating. In my experience it is inadvisable with most outfits at present on the market to run the engine at full speed for longer than 15 minutes at a time. Improved cooling is certainly one of the points to which I hope the engineers will devote their attention.

The improvement of the field technique of dusting is, I think, essentially a matter to which the practical planter can contribute, and I shall be very interested to hear any views and suggestions. I may mention one line along which we are working. The treatment of the very early and very late wintering trees has always proved something of a problem as it is

impracticable to direct the cloud on to individual trees with a power machine, and a general dusting is wasteful of sulphur if only a small proportion of trees are in young leaf.. We conceived the idea of exploding a small cloud of sulphur just below the crown of individual trees by means of a bomb, and although the method is still in the experimental stage I may say that the preliminary trials show considerable promise. This method may also bring sulphur dusting within the reach of the smallholder who would obviously be unable to afford the high initial cost of a machine.

TIME AND NUMBER OF APPLICATIONS

If there is one factor that is more responsible than any other for disappointing results, it is too long a delay in making the first application. In the leaflet on sulphur dusting issued by the Rubber Research Scheme last year I wrote that the first application should be made at the earliest sign of strong Oidium attack on the young leaf produced after the annual winter. If I were to re-write that article now I should omit the word "strong", as our ideas of "strong" infection are not, perhaps, always the same. At mid-country elevations the first infection coincides so nearly with the production of young leaf that operations should be started with the commencement of refoliation. In a season, such as the present, in which the winter follows a very irregular course the correct time to make the first application is not easily judged, but it is usually early enough when some 15 per cent. to 20 per cent. of the trees are beginning to re-foliate. The point I wish to emphasise is that it is far better to begin too early than too late. A delayed start permits the rapid multiplication of the fungus which then becomes very difficult to control unless large quantities of sulphur are used.

As regards the number of applications and the interval between them, there is little to add to what I have written in previous reports. It is desirable to reduce the interval to as short a period of time as possible, with a corresponding adjustment in the rate of application and the number of rounds. Seven days is regarded as the standard interval, and programmes should be arranged accordingly. It is impossible to forecast the exact number of applications necessary as this will depend on the course of refoliation.

QUANTITY OF SULPHUR

When this year's programmes were arranged there seemed, in some quarters, to be insufficient realisation of the fact that the quantity of sulphur necessary to secure effective control varies considerably according to conditions. Whereas 25 lbs. per acre for the season may be sufficient in the low-country, as much as 75 lbs. may be required at an elevation of 2,000 ft. This, of course, is due to the far greater incidence of the fungus and the more protracted refoliation at the higher elevations

One of the main lessons to be learned from this year's work is the necessity of having an elastic programme, the actual details being left to the discretion of the man on the spot. It is impossible to forecast the severity of the attack in any particular year, and I have always recommended that an excess of sulphur over anticipated requirements be available on the estate in case the attack is unusually severe or the refoliation abnormally prolonged. Any sulphur that is not required can be kept quite satisfactorily till the following year. The conditions for dusting in Matale this year have, I understand, been unusually favourable, little interference by rain being experienced, and it might be wise to estimate for the use of rather more sulphur next year. On the other hand it is probable that as the result of successive years' dusting the disease will gradually be brought under better control, and the quantities of sulphur necessary reduced accordingly.

SUPERVISION

The importance of careful supervision of the work by the Superintendent himself has always been emphasised, but I may say that I have this year seen excellent results obtained on several estates where an intelligent conductor has been trained to the work. It would be most dangerous to suggest that sulphur dusting is an operation which can automatically be handed over to the subordinate staff, but there seems no reason why a man who is not only intelligent but also conscientious should not be able to relieve the Superintendent of much of the supervisory work. I have personally found that supervision is best exercised by keeping some distance from the machine and directing operations by a system of hand signals.

COSTS

I have been privileged to see details of the costs of this year's work on a number of estates in this and other districts.

In the mid-country the figures have varied from about Rs. 3/- to Rs. 6/- per acre, including all charges except depreciation on the machine. For the highest elevations, however, the cost may be as high as Rs. 8/- or Rs. 9/- per acre. On the supposition that one machine is sufficient for 500 acres, and that its cost should be written off in three years, a sum of 80 cents per acre per annum must be added to the above figures. On the basis of a restricted crop of 250 lbs. per acre, sulphur dusting adds about 2 cents per lb. to the cost of production. In view of the results obtained this must, I think, be considered a very moderate premium as an insurance against the serious and lasting damage that is the inevitable consequence of severe attack for a number of years.

TAINT OF TEA

This address would be incomplete without a reference to the possibility of neighbouring Tea becoming tainted by drifting sulphur. I have always expressed the opinion that provided reasonable care is taken on the margin of Tea fields the danger of taint is insufficient to constitute a serious objection to the treatment, and I have no reason to modify this view. There is no doubt that sulphur can cause a very marked and unpleasant taint if it falls on the Tea in sufficient quantity, but unless the Tea and Rubber fields are much intermingled there is no reason why more than the very smallest quantities of sulphur should ever fall on the bushes. My own experiences is confined to a field of 30 acres which has now been dusted for six successive years. This field is completely surrounded by Tea, and the Superintendent would tell you that his Teas have not suffered in consequence. The danger is obviously at its greatest where the Rubber consists of small units scattered amongst Tea fields, but even in such cases I think the trouble could be obviated by arranging for the dusting to be carried out immediately after plucking.

In conclusion, I must thank you for inviting me to your meeting to-day, and I hope that any points with which I have not been able to deal will be raised in the subsequent discussion.

DEMONSTRATION OF THE CONTROL OF OIDIUM ON SMALL-HOLDINGS IN 1935

W. I. PIERIS, B.A. (CANTAB.) HORTIC.
SMALL-HOLDINGS OFFICER,

FOLLOWING the unprecedentedly severe outbreak of the leaf disease caused by Oidium Hevea in Ceylon during the refoliation period of 1934, attention was drawn by the Rubber Research Scheme to the importance of control measures being undertaken in mid-country areas where the effects of the disease are, as a rule, most severe. As part of a programme for extending the Scheme's experimental and educational work on the disease, it was decided to demonstrate the control of Oidium by sulphur dusting on a number of small-holdings in mid-country areas during the 1935 refoliation season. This work was taken charge of by the writer and carried out during the period February to April 1935.

SELECTION OF CENTRES

Demonstrations were confined to 5 centres in and around the mid-country district of Matale where the disease usually manifests itself with greater severity than elsewhere. The centres chosen were Gampola, Katugastota, Galagedera, Rattota and Matale North at each of which a detached small-holding was selected, 4 to 10 acres in extent, adjoining a main road, and in the neighbourhood of other untreated rubber with which it could be compared after treatment. The selection of suitable holdings was greatly facilitated by the kind co-operation of the Divisional Agricultural Officer, Central, and his Staff.

The selection of holdings and other preliminary arrangements were made in December 1934 and early January 1935. Thereafter a close watch was kept on the progress of refoliation in each holding so that dusting could be commenced at the correct time *i.e.*, at the earliest sign of infection on the new

leaf. This was found to be almost coincident with the production of the young brown leaflets and the first application was in all cases made as soon as about 20 per cent. of the trees had started to refoliate. The local Agricultural Instructors were of great assistance in watching the progress of refoliation while the writer was stationed at Culloden.

TRANSPORT

For the transport of the dusting machine and sulphur to the various holdings a one-ton lorry was hired from Kandy at an approximate average rate of 20 cents per mile. This arrangement proved entirely satisfactory.

DUSTING OPERATIONS

The first small-holding to become ready for dusting was at Gampola and dusting was commenced here on February 4th. The next to be ready was at Katugastota followed by those at Galagedera, Rattota and Matale North which received their first dustings on February 6th, 12th, 21st and March 7th respectively. It will be observed that owing to differences in times of wintering there was a divergence of over one month between the first dusting at Gampola and that at Matale North, with the result that the work was spread over a longer period than would otherwise have been the case.

Following the first application, dustings were continued on each holding at intervals of 7 to 9 days until approximately 80 to 90 per cent. of the trees had matured their leaf. Here again great variation was experienced in the time taken by the various holdings to complete refoliation, some doing so far less evenly than others. This fact is apparent from the table below which shows that whereas the Gampola holding had its dusting completed in 45 days with 7 dustings, the Rattota holding necessitated 10 dustings lasting over a period of 68 days.

Situation of holding	Approximate acreage	Date of 1st dusting	Date of final dusting	Total No. of dustings
Gampola	7	4-2-35	21-3-35	7
Katugastota	4	6-2-35	3-4-35	9
Galagedera	10	12-2-35	3-4-35	8
Rattota	$3\frac{1}{2}$	21-2-35	30-4-35	10
*Matale North	7	7-3-35	30-4-35	9

* An adjoining holding of 3 acres which wintered very late was also given 6 dustings.

As the most central situation for tapping the different dusting centres, residence was taken up at Kandy from 10-2-35 to 30-4-35 for purposes of this work, 2 dustings previous to the former date having been given from Peradeniya.

DEMONSTRATIONS

Although the entire programme of the present dusting was meant to be educative and interested small-holders and others were welcomed and given every opportunity to see and learn about sulphur dusting on any ordinary dusting day, a special demonstration was held at each of the 5 centres, usually at about the second or third dusting. On these occasions as many small-holders of the district as possible were assembled at the place of demonstration and the assembly addressed in Sinhalese on the purpose and manner of the control of Oidium by sulphur-dusting. The address was followed by a discussion during which enquiries were answered. Thereafter an actual demonstration of dusting of a holding was given and any further questions answered. Demonstrations were given as follows: Gampola—February 19th, Galagedera— February 22nd, Katugastota —March 8th, Rattota—April 4th and Matale North—April 11th.

NOTICE

In notifying small-holders of these demonstrations and assembling them, the writer was dependent on the co-operation of the Government Agent, Central Province and the Divisional Agricultural Officer, Central and their staffs, whose assistance was greatly appreciated.

ATTENDANCE

The attendance at demonstrations which was inclined to be disappointing at first steadily increased on each occasion until a total of 68 and 72 respectively was present at the last two demonstrations. The attendance tended to vary according to the number of small-holdings in the district, the thoroughness with which notice had been circulated and other factors but the chief hindrance appeared to be the malaria epidemic. Other than small-holders the attendance often included local State Councillors, officers of the Department of Agriculture, Ratemahatmayas, local planters both Sinhalese and European, Presidents of Village Committees etc.

RESULTS AND OBSERVATIONS

The beneficial effects of the treatment became evident well in advance of the final completion of dusting operations. In

comparison with neighbouring undusted rubber, the absence of leaf-fall (resulting in markedly fuller canopies), the almost absent spotting, distortion and discolouring of leaflets, the glossier and richer green foliage and the abundance of flower on each of the dusted holdings presented a marked difference in general appearance. The average Sinhalese cultivator, whose experienced eye is second to none in observing abnormal conditions in his holding and who had already noticed that 'something was amiss' with his rubber trees during 1934, required little persuasion to appreciate the benefits obtained and manifested considerable interest at this stage of the work. In support of his acumen in this respect it might be mentioned that several of them pointed out to the writer before he could do so to them, the healthy appearance of the foliage and the presence of prolific inflorescences on dusted trees as compared with undusted trees and general conditions which obtained on the identical holdings in 1934. Observations, however, indicate that even on untreated holdings the disease appears to cause less damage than on neighbouring large estates which usually occupy the higher and more exposed situations. Dusting operations on the whole evoked considerable curiosity among the villagers and the writer feels that it would not be far wrong to state that there could be few rubber small-holders in any of the districts dealt with who do not now know something about Oidium and its control by sulphur-dusting.

ENQUIRIES

Both at demonstrations and ordinary dustings a number of intelligent enquiries was made. Among the chief of these was whether sulphur dusting of small-holdings would be undertaken in future years and whether any charge for the work would be levied on owners. A number of applications was received from the more progressive holders to have their holdings treated. The majority of such requests was made in the expectation that the work would be done without charge but it was felt that a few of the more well-to-do owners would have been sufficiently keen to pay a small fee. To these requests, practically all of which were made too late in the season for dusting to have had any beneficial effect, the answer had to be given that it was outside the scope of the present programme to undertake dusting except in the demonstration areas and that the possibility of arranging for the treatment of small-holdings and

estates was still under consideration. A certain amount of concern was manifested regarding the effect of sulphur being blown on to other crops in the neighbourhood, but the nature of this was as much favourable as unfavourable, in that some regarded sulphur as a universal panacea for diseases of all crops and others as a possible 'plague' to anything other than rubber. Both by explanation and result the latter were convinced that deleterious effects were extremely unlikely.

SULPHUR

During the course of the dusting operations a total of $18\frac{1}{4}$ cwt. of sulphur of two different makes "Olite" and "Cirrus", was used. The quantity used per acre per dusting worked out at 7 lb.

MACHINE

Dusting was done throughout with a new $3\frac{1}{2}$ h.p. dusting machine of British make. No serious trouble was experienced. On holdings where the trees were very tall, difficulty was sometimes experienced on windy days in projecting the sulphur to the tops of the trees.

LABOUR

Local Sinhalese labour was employed for carrying the machine. Although two and sometimes even three holdings were dusted in a day, a different set of labourers had to be used at each holding owing to the widely scattered nature of the latter. Otherwise it would have been more economical to carry a trained set of men from place to place at a fixed daily wage. Only at the Rattota and Matale North holdings was it possible to use the same set of men owing to transport facilities which did not obtain elsewhere. It was found possible to use 4 instead of the usual 6 men for carrying the machine and bringing sulphur on account of the smaller acreage dusted at a time. A certain amount of difficulty was at times experienced in procuring able-bodied and willing men, due to fairly universal debility resulting from the effects of the malaria epidemic.

The supplying of cheap goggles for the "carriers", though not done this tme, is recommended in view of the discomfort to the eyes experienced by some of them. It was further felt that, owing to the unweeded state of some of the holdings, even a more necessary need was the provision of some form of covering for the soles.

COSTS

The costs per acre per application computed below have been arrived at from actual expenses incurred in connection with the dusting.

Item	Cost per acre per application
	Rs. cts.
7 lb. sulphur @ 10 cts. (*i.e.*, including rail freight from Colombo to Kandy)	·70
Labour $\left(\text{i.e., } \frac{\text{total wages paid to labourers}}{\text{total acres dusted}}\right)$	·19
Petrol $\left(\text{i.e., } \frac{\text{total cost of petrol}}{\text{total acres dusted}}\right)$	·038
Oil $\left(\text{i.e., } \frac{\text{total cost of oil}}{\text{total acres dusted}}\right)$	·004
	0·93*

* This figure does not include cost of lorry transport of machine and sulphur to holdings or depreciation of machine.

The cost per acre for the season worked out at approximately Rs. 8·50. This figure when compared with normal dusting costs is definitely high, but it has to be borne in mind that labour costs were unusually high owing to the widely scattered nature of the holdings. Expenses in general were further increased by the abnormally large number of dustings necessitated by the uneven wintering of the majority of the holdings

CINEMATOGRAPHY

100 feet of supersensitive 16 mm. Ciné film was 'shot' by the writer with his private apparatus in an attempt to cinematograph the dusting of a holding. The film which has since been processed and projected has proved entirely successful and presents a clear and vivid pictorial record of the sequence of events at a demonstration.

For purposes of propaganda it is felt that cinematography would be a most useful asset, far more effective, no less easy to manipulate and not much more expensive except in initial outlay, than the laborious process of lantern demonstration. During such months of the year when sulphur dusting is not actually practised there could be no better medium of demonstration than a cinematograph display.

Weather conditions were exceptionally favourable throughout the period of dusting except during a brief spell towards the end of March when afternoon showers were experienced. This fact proved a considerable asset both in the accomplishment of the work and the very marked results obtained.

ACKNOWLEDGMENT

The Rubber Research Scheme is greatly indebted to the Government Agent, Assistant Government Agents and Ratemahatmayas of the Central Province, the Divisional Agricultural Officer, Central and his Agricultural Instructors, Mr. D. B. Uduwawala (retired R.M.) of Kaikawala, Matale, and several others for their valuable assistance in connection with the demonstrations. Thanks are also due to the owners of holdings on which the demonstrations were carried out.

CEYLON CLONES—III

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BOTANIST AND MYCOLOGIST

FOREWORD

THIS article, presenting data for 1934, is the third of a series of annual reports on the test-tapping of Ceylon clones. The previous reports were published in Rubber Research Scheme *Quarterly Circular*, Vol. 10, Part 2, 1933, and Vol. 11, Part 1, 1934.

Test-tapping was further extended during the year, the total number of clones in tapping either at the Experiment Station, Nivitigalakele, or on estates co-operating with the Scheme being 85, represented altogether by 826 trees. Four new clones of promise have been added to those given in previous lists.

Acknowledgement is here made to the undermentioned proprietors who have kindly given permission for the publication of the records of clones established from mother-trees on their properties:—

The Govinna Rubber Company, Ltd.
The Lavant Rubber Company, Ltd.
The Mirishena (Kalutara) Rubber Company, Ltd.
The Dimbula Valley (Ceylon) Tea Company, Ltd.
The Rosehaugh Company, Ltd.
The Gallawatte (Ceylon) Rubber Co., Ltd.
Mr. C. E. A. Dias.

PRESENTATION OF RESULTS

A departure has been made from the former method of presenting the yield data. Although records of the individual trees are still kept for each clone, it is thought that these details are not of general interest and only the average for the clone is now given. Table I contains the average yield for all

clones in grams of dry rubber per tree per tapping for each month and for the whole year. The actual yield in lbs. per tree and the number of tappings are also given.

Since the tapping system and the full number of tappings varies on the different estates it is somewhat difficult to compare the clones on the basis of their actual performance. An attempt has accordingly been made to reduce all yields to a common basis, and Table II gives calculated figures for 130 tappings on the half-spiral alternate day system at the different ages. The number 130 was adopted after due consideration as probably equivalent in full tappings to the average number of tappings (full and partial) obtained on the alternate day system in estate practice in Ceylon. It will be noted that the number of recorded tappings falls short of 130 except on Milleniya and Wawulugala Estates (65 tappings on the double-four system are equivalent to 130 for alternate day tapping). The trees were actually tapped on a number of additional occasions, but days on which partial washouts occurred are not included in the records. Ceylon is a difficult country in which to conduct test-tapping owing to the frequent interference to tapping by morning rains, and it is not easy to strike a satisfactory compromise between accurate recording of the yields of individual trees and normal estate practice.

In reducing the yields on the double-four system to a single cut alternate day basis the assumption has been made that the yield per cut per tapping is the same on the two systems. Estate and experimental data show this to be approximately true.

Owing to pressure of other work the writer has not been able to make the usual visits of inspection to the estates on which the test-tapping is being conducted, and further observational data, measurements of bark renewal etc. are therefore lacking.

CLONES AT EXPERIMENT STATION, NIVITIGALAKELE

The methods of tapping and recording have continued as described in previous reports. Any change in the panels is recorded for the clone in question.

Govinna 771.—Reference to the Tables will show four groups of trees in tapping. The group marked A consists of the original trees of which previous records have been published,

and were the first twelve trees to attain the necessary girth for tapping. The panels were changed over in April, cuts being opened on the opposite side at 24 ins. from the union. One tree was taken out of tapping owing to damage by wind.

Group B comprises 10 trees (reduced to 9 owing to wind damage) selected at random from the original 1927 buddings as soon as these were all of tappable size. The trees may therefore be regarded as representative of an average stand, the smaller as well as the larger trees being included. Cuts were opened at 24 ins. from the union. It will be noted that the average yield, 16·2 grams per tapping, is considerably lower than that of the 12 trees of the same age in Group A owing to the smaller girth. The growth of these grafts is below average, though on the basis of girth the yield is high.

Groups C and D constitute a comparison of half-spiral alternate day tapping with the double-four system on six-year old grafts, the comparison being also made on younger trees of Clone Lavant 28. The two cuts on the double-four system were opened at 48 ins. and 24 ins. from the union respectively, and half the trees on the alternate day system were tapped at 48 ins. and half at 24 ins. With both clones a slightly higher yield per cut per tapping was obtained with alternate day than with double-four tapping.

The figures from the four groups of Clone Govinna 771 show that the yield, although at present not outstanding, is considerably higher than for average seedlings of the same age and girth. The clone, however, possesses certain defects, enumerated in previous reports, and is unlikely to prove of commercial value.

Lavant 28.—The yield of the original 12 trees (Group A) shows a substantial advance, doubtless partly due to the lowering of the cut to 24 ins. from the union. At present, however, the clone can only be regarded as a moderate yielder, though growth and secondary characteristics are entirely satisfactory.

Groups C and D are as described for Clone Govinna 771.

Eladuwa 1.—This clone must also be numbered amongst those of fair but not outstanding promise, the increase from 9·2 grams per tapping in 1933 to 17·8 grams in 1934 being satisfactory. No change was made in the tapping panel, the cut being at a height of 39 ins. at the end of the year.

Millakande 3/2.—Tapping of this clone was started in November 1933 at the early age of less than 3½ years, and outstandingly rapid growth on a poor lateritic soil is its main characteristic. The average yield of 10·7 grams per tapping at 4 years old must be considered very promising The height of the cuts was 43 ins. at the end of the year.

HILLCROFT CLONES

We are again indebted to Mr. L. P. Gapp for close co-operation in the test-tapping of the Hillcroft clones on Stennes Estate. No alteration has been made in the methods of tapping and recording described in prevous reports.

Hillcroft 28.—The average yield per tapping for 1934, 60·9 grams, is a satisfactory increase over the 1933 figure of 46·7 grams.

As explained in last year's report the twelve trees from which the records have hitherto been derived are amongst the largest in the stand, and the figures are not therefore entirely representative if judged on an age rather than on a girth basis. Particular interest is therefore attached to the performance of the remaining 56 trees of the clone, which were taken into commercial tapping last year. Complete records were not kept for the whole year, but measurements of latex were made for each individual tree for the months July and August. The following figures show the average girth and latex yield of the 56 trees in commercial tapping, and of the 12 trees in test-tapping, for these two months:—

	56 Trees C.T.		12 Trees T.T.	
	Average Girth	ccs. latex per tree	Average girth	ccs. latex per tree
July	25·1 ins.	116	32·5 ins.	173
August		118		158

The high yield of the 12 trees in test-tapping is thus confirmed by the results from the balance of the clone, though the yield from the latter trees is lower in accordance with their smaller girth.

There is no doubt of the exceptionally high yield given by the clone, and it is now necessary to study secondary characteristics. Until recently the only defect developed was a spiral fluting of

the stem, which becomes very marked on some trees. In January, 1935, however, two of the trees in test-tapping developed Brown Bast, and the clone will be kept under careful observation for any further development of this condition.

Hillcroft 34.—The yield of this clone has remained almost stationary for the last three years. As explained in previous reports the trees show certain undesirable features which militate against its economic value, and yield recording has now been discontinued.

Hillcroft 55.—The remarkable variation in individual yields, to which attention was drawn in the previous report, has continued. Whereas the highest yielding tree averaged 101·3 grams per tapping for the year, the lowest gave only 16·0 grams, and there is every gradation between the two. The differences are not wholly explicable on the basis of girth, and it will be interesting to observe whether a similar variation occurs within a further group of younger grafts which are now being test-tapped on another estate.

One case of Brown Bast was reported last year, but no further outbreak has occurred.

MILLENIYA AND WAWULUGALA CLONES

In this section are included clones tapped on Milleniya and Wawulugala Estates, and we are again indebted to Mr. C. E. A. Dias for his co-operation.

On both estates the trees were tapped on the double-four system, *i.e.*, two opposite half-spiral cuts tapped once in four days, and were not rested during the wintering period. The heights of the two cuts were somewhat variable, the average at the end of the year being about 27 inches and 13 inches on Wawulugala Estate, and 22 ins. and 8 ins. on Milleniya Estate. The biscuits from the individual trees were sent to these laboratories each month to be dried and weighed.

There are no new observations to be recorded for these clones. Clone Wawulugala 259 is the most productive, having averaged 14·5 lb. per tree on Milleniya Estate for 79 tappings (approximately equivalent to 158 tappings on the alternate day system). This clone has developed no important defects and may now be regarded as of commercial value.

Clone Wawulugala 320 gives a very high yield taking into consideration the small size of the trees, and would probably prove very suitable for close planting.

Clone Milleniya 113 is included in these notes for the first time and appears to be of considerable promise. The writer has not had the opportunity of inspecting the trees and making observations regarding the habit of growth, bark condition, etc.

GALLAWATTE CLONES

The two clones of which yield records are given in the Tables are established in a clearing on Gallawatte Estate which was planted with stumps in 1925. The trees in test-tapping were budded on these large stocks in August-September, 1928. In September, 1933, 22 clones of local origin were taken into test-tapping, and of these the two mentioned in this report, Gallawatte 2 and 24, have so far proved the most promising. It is as yet too early to form an opinion as to their probable economic value.

We are indebted to Mr. J. F. Templer, Superintendent of Gallawatte Estate, for his co-operation in this work. The methods of tapping and recording are identical with those employed at Nivitigalakele, the biscuits from each individual tree being forwarded every month to these laboratories to be weighed. The trees are tapped on alternate days on a half-spiral cut, the height of the cuts being about 42 inches from the union at the end of the year.

TABLE

Clone	Where tapped	No. of trees	Average Age years	Average Girth ins. at 3 ft. on 1/7/34	Average yield per tree per tapping in oz. 1932	1933	Jan.	Feb.	Mar.	RESTED
Govinna 771 (A)	Nivitigalakele	12-11	7	26·0	13·1	16·2	24·3	22·5		
Ditto (B)	Ditto	10-9	7	21·4						
Ditto (C)	Ditto	10-9	6	21·8						
Ditto (D)	Ditto	10	6	20·9						
Lavant 28 (A)	Ditto	12	6½	27·8	6·8	10·6	16·0	14·2		
Ditto (C)	Ditto	10	5	22·3						
Ditto (D)	Ditto	10	5	22·6						
Eladuwa 1	Ditto	12	5½	23·9		9·2	10·5	10·2		
Millakande 3/2	Ditto	12	4	21·6			7·1	5·9		
Hillcroft 28	Stennes	12	8	32·5	41·9	46·7	48·0	54·7		
Hillcroft 34	Ditto	7	8	24·2	31·4	28·3	26·2	31·6		
Hillcroft 55	Ditto	10-9	8	30·9		49·1	50·2	55·6		
Wawnlugala 120	Milleniya	10	7	24·9			39·4	27·3	27·3	
Ditto	Wawulugala	10	7	26·5			42·7	39·7	32·5	
Wawulugala 259	Milleniya	10	7	27·1			78·8	54·1	59·9	
Ditto	Wawuiugala	10	7	29·8			73·5	73·2	66·0	
Wawulugala 320	Milleniya	10	7	22·8			54·6	51·1	39·7	
Ditto	Wawulugala	10	7	23·9			55·3	63·4	43·0	
Milleniya 113	Milleniya	10	8	32·3			72·0	55·9	58·0	
Milleniya 191	Ditto	10	7	25·8			53·1	25·5	32·9	
Ditto	Wawulugala	10-8	7	31·4			62·6	59·8	57·1	
Gallawafte 2	Gallawatte	10	6	22·9			13·5			
Gallawatte 24	Ditto	10	6	22·3			15·5			

½ sp.a.d. = ½ spiral alternate day.
D/4 = Double-four *i.e.* tapping on two opposite half sp

I

ield in grams dry rubber per tapping										Tapping system	No. of tappings	Yield per tree in lb.
pril	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	1934			
5·7	18·7	14·8	22·6	27·0	29·6	32·6	35·2	30·5	25·4	½sp.a.d.	110	6·1
9·0	11·0	10·5	15·1	17·4	15·9	20·5	21·4	20·8	16.2	do	94	3·4
7·4	9·1	8·9	15·8	16·5	16·9	22·7	22·7	21·9	16·7	do	94	3·5
1·0	14·4	16·6	28·7	32·8	32·5	39·1	44·3	42·5	29·7	D/4	53	3·5
0·7	13·8	9·9	18·7	18·4	20·8	25·5	31·6	24·7	19·2	½sp.a.d.	110	4·6
3·9	6·0	4·7	9·9	9·1	10·2	12·4	14·1	13·3	9·7	do	95	2·0
5·8	10·4	7·5	17·0	17·9	19·3	20·5	26·4	23·5	17·0	D/4	52	1·9
1·3	13·9	13·3	17·9	21·0	20·2	23·5	26·9	20·1	17·8	½sp.a.d.	110	4·3
6·8	6·8	6·5	10·7	9·9	10·8	15·5	18·0	15·3	10·7	do	110	2·6
6·1	67·7	60·1	72·6	65·0	64·7	50·4	61·6	63·8	60·9	do	101	13·5
9·2	22·3	30·6	39·3	36·3	37·9	30·1	34·6	30·4	32·1	do	101	7·1
4·5	45·1	48·4	53·1	54·2	57·4	43·9	47·4	56·9	53·3	do	93	10·7
6·3	37·9	34·9	39·5	46·6	49·5	61·0	69·2	61·0	44·0	D/4	79	7·6
8·7	28·1	27·4	45·1	39·2	48·1	56·4	53 7	50·7	41·6	do	75	6·9
4·9	75·0	72·8	74·7	86·2	89·3	107·5	121·1	131·2	83·1	do	79	14·5
6·8	52·9	51·7	66·3	60·4	78·2	86·8	77·8	69·5	68·1	do	75	11·3
1·3	41·0	39·8	45·1	50·9	63·3	75·2	74·9	72·5	54·8	do	79	9·6
9	36·4	35·8	50·5	51·6	71·0	74·3	67·6	69·1	55·1	do	75	9·2
6·1	60·9	49·0	66·3	86·7	92·4	99·2	112·4	94·2	75·1	do	79	13·2
2·0	51·7	48·3	62·5	67·5	65·3	73·5	98·2	86·2	59·2	do	79	10·4
1·4	42·1	40·1	57·3	63·6	75·8	96·3	84·8	96·2	65·6	do	76	11·0
9·6	13·1	18·5	21·8	19·4	16·3	18·3	21·0	25·0	17·8	½sp.a.d.	99	3·9
3·1	12·4	17·2	19·6	19·7	16·8	19·3	23·6	21·8	17·9	do	99	3·9

every four days.
iral cuts,

TABLE II

Clone	No. of Trees	Calculated yield in lb. per tree for 130 tappings on ½ spiral alternate day at ages of (to nearest half year).									
		4		5		6		7		8	
			4½		5½		6½		7½		
Govinna 771 (A)	12-11			3·7		4·6		7·3			
Do (B)	10- 9							4·6			
Do (C)	9					4·7					
Do (D)	10					4·2					
Lavant 28 (A)	12		1·9		3·0		5·5				
Do (C)	10			2·8							
Do (D)	10			2·4							
Eladuwa 1	12		2·6		5·1						
Millakande 3/2	12	3·0									
Hillcroft 28	12					12·0		13·4		17·4	
Hillcroft 34	7					9·0		8·1		9·2	
Hillcroft 55	10-9							14·0		15·2	
Wawulugala 120	10							6·3			
Do	10					4·8		5·9			
Wawulugala 259	10							11·9			
Do	10					8·0		9·7			
Wawulugala 320	10							7·8			
Do	10					6·3		7·9			
Milleniya 113	10									10·7	
Milleniya 191	10							8·5			
Do	10-8					6·2		9·4			
Gallawatte 2	10					5·1					
Gallawatte 24	10					5·1					

OPENING OF FACTORY AND LABORATORY AT DARTONFIELD ESTATE BY H. E. SIR REGINALD STUBBS, G.C.M.G.

(Reproduced from the "Times of Ceylon")

ANOTHER stage in the development in the Rubber Industry was reached when His Excellency the Governor officially opened on February 25th, 1935 the experimental rubber factory and laboratory at Dartonfield Estate, Agalawatte

His Excellency, accompanied by his Private Secretary and Dr. W Youngman (Director of Agriculture), reached Dartonfield Estate at 3 p.m. He was garlanded by Mudaliyar Corea under an artistic pandal at the turn to the estate from the main road.

His Excellency was introduced, opposite the new factory, to the following members of the Board of Management, Rubber Research Scheme: Messrs. C. H. Collins, C.C.S. (Deputy Financial Secretary), I. L. Cameron, L. B. de Mel, J.P., U.P.M., C. E. A. Dias, J.P., George E. de Silva, M.S.C., F. H. Griffith, L. P. Gapp, Hon. Mr. F. A. Obeyesekere (Speaker of the State Council), Messrs. C. A. Pereira, B. M. Selwyn, E. W. Whitelaw and Col. T. Y. Wright.

The following members of the technical staff of the Rubber Research Scheme were next introduced to His Excellency: Messrs. T. E. H. O'Brien (Director of Research and Chemist), R. K. S. Murray (Botanist and Mycologist), W. I. Pieris (Agricultural Assistant), M. W. Philpott (Assistant Chemist) and Mr. D. L. Nicol (Estate Superintendent).

The following were also introduced to His Excellency: Representatives of the contractors for the factory, Messrs. Brown & Co., viz., Messrs. J. D. Lawson (Managing Director), Mr. H. E. Broadbent (Chief Engineer); Mr. H. P. Billimoria (representative of the architects for the laboratory and other estate buildings, Messrs. Billimoria & De Silva), and Mr. F. D. Wijeyanayake (representative of the contractors for the laboratory, Messrs. Fonseka & Co.).

The formal opening of the experimental factory by His Excellency was followed by a meeting in the factory which was addressed by Dr. W. Youngman (Chairman of the Board, Rubber Research Scheme). In his address Dr. Youngman said:

Your Excellency, ladies and gentlemen,—We are extremely grateful to His Excellency for coming here today and thus giving us encouragement and a gesture of his interest in the rubber growing industry of this Island.

The pioneer work of introducing rubber into Ceylon is a thrilling chapter in modern history into which it is not intended to go now, but it is interesting to note that original trees brought to Ceylon in 1876-1878 still stand at Peradeniya, Heneratgoda and on Culloden Estate, Neboda, in which latter place they were planted in 1878 by the late Sir Leybourne Davidson.

The owners and Superintendents of Culloden Estate have always been interested in promoting rubber research and the foundations of the Rubber Research Scheme of Ceylon were closely connected with that estate. About 1909 the Rubber Growers' Association stationed a chemist at Culloden Estate for the purpose of assisting its members, who were largely London companies, in the preparation of raw rubber. A mycologist was appointed in 1914.

Other rubber producers in Ceylon, who were not members of the Rubber Growers' Association saw the necessity for scientific research and assistance. In 1913 the Government of Ceylon enlisted the aid of the Imperial Institute and initiated the Ceylon Rubber Research Scheme, Government putting up 60 per cent. of the necessary funds and the contributing plantations, not members of the Rubber Growers' Association, 40 per cent.

A scientific officer, styled the Rubber Chemist, was stationed at Peradeniya and later at Gikiyanakande Estate especially to study certain physiological problems of the rubber tree and to prepare samples of rubber for further tests at the Imperial Institute, London.

In 1920 an amalgamation of the above two separate schemes very wisely took place, and a fuller Ceylon Rubber Research Scheme with a larger staff working in laboratories at Culloden came into being.

In 1926 an area of some 60 acres of land at Nivitigalakele was leased from Government for the development of a station for the testing of budgrafts clones from high-yielding Ceylon trees. This area has recently been extended by a further lease of 100 acres of Crown forest adjoining it.

The necessity and value of the work of the Scheme to the industry were becoming more and more apparent and in 1930 Ordinance No. 10 came into force providing finances by a cess of $\frac{1}{8}$ cent on every pound of rubber exported from Ceylon and constituting a Board of Management representative of all interests of the industry.

Close association with the Imperial Institute had all along been maintained and the Rubber Industry of Ceylon is indebted to that institution for housing a staff maintained from the Scheme's funds who work in the Institute's laboratories at South Kensington. Further valuable advisory assistance has been furnished by a London Advisory Committee, who find board-room accommodation and secretarial assistance in the Institute.

The Research Scheme here on the spot deals with investigation of plantation aspects, work to effect any improvement in the raw product and its production in forms required by the manufacturer, as well as investigation of the possibilities of local production of certain articles. The London Advisory Committee on the other hand is situated in a position to keep in touch with the requirements of the manufacturer.

A tribute to the value of the London Advisory Committee was made in 1931 when the Rubber Research Institute of Malaya joined forces with the Ceylon Rubber Research Scheme and contributed half the cost of the upkeep of the London laboratories and staff. This partnership continues.

The Research Scheme had all along been handicapped by being confined within narrow limits. It was necessary to extend its plantation experiments and the Board in 1933 purchased Dartonfield Estate of 178 acres, a purchase made at a very advantageous time.

The Scheme is still at a disadvantage in that its estate is like Gaul and ancient Ceylon divided into three parts. A point the Board of Management will have to consider in the near

future is consolidation by bringing the whole of the scientific staff and laboratories to Dartonfield and the opening today of this experimental factory and chemical laboratory on its own estate may perhaps be regarded as a step toward that end.

The factory was built and equipped by Messrs. Brown & Co., Ltd., of Colombo, at a cost of some Rs. 66,000, and contains experimental machinery costing Rs. 25,000. The factory consists of two portions, in one of which is the most modern equipment for the preparation of raw rubber in the forms of crepe and smoked sheet, and for the preparation of latex and crumb rubber, and a space is available for erecting a machine for concentrating latex by centrifugal means. The other part of the factory contains machinery for the experimental manufacture and vulcanization of products. All the machinery is electrically operated.

The laboratory was designed by Messrs. Billimoria & De Silva and built by Messrs. Fonseka & Co., and provides equipment for research on the utilisation of rubber and is fitted with gas, electric power and water. The total cost of the laboratory and its equipment is Rs. 30,000.

The Board of Management is indebted to its staff and to the members of its Estate Committee under the able Chairmanship of Mr. F. H. Griffith for the energy they all have put in to bring these buildings and the estate into the condition in which they are today. The members of the Estate Committee have been most generous in the services they have given to the project and we are very grateful to them.

As Chairman of the Board of Management now for a period of five years, I should be lacking in my duty if I did not thank the members past and present for the harmonious working and loyal support that I have experienced and which have enabled us to bring this project to the present stage of development.

The industry which provides the funds I would also not forget, and sincerely trust its members may reap their reward in the benefits that will result from the scientific experiments that the scheme carries out and in an early return of more substantial prosperity to the Rubber Growing Industry of Ceylon.

H. E. THE GOVERNOR

Rising amidst applause His Excellency the Governor said he had much pleasure in being present to declare the buildings open. The industry had been through many hard times, His Excellency remarked. The periods of distress which the industry had gone through and was going through now indicated how very necessary it was that the rubber industry should have recourse to scientific advice and treatment in every respect.

His Excellency proceeded to state that the present system of rubber restriction was necessary no doubt. Nobody who had views on it could look on it with respect or affection as a permanent feature in life; and one could only hope that the industry would be able so to develop—that it would be able in a seasonable period of time to stand on its own feet.

In order that they might get away from this unfortunate period of restriction, it was very necessary that the rubber industry should make efforts to find not only new uses for rubber but to improve its output and secure efficiency and economy. There was no means of securing this without the assistance of the scientist, His Excellency added.

His Excellency further observed that the rubber industry was one of the greatest importance to this country not only to wealthy people, whom he saw round there, but also to the smallholders. Any project to improve the prospects of the rubber industry must, therefore, be fraught with great importance to the interests of this country as a whole and to the Ceylonese as a nation.

In conclusion, His Excellency expressed the hope that the factory, which he had pleasure in opening would greatly assist in the returning prosperity of this country.

In proposing a vote of thanks to His Excellency the Governor, Col. T. Y. Wright said: "Being one of the oldest members of the Rubber Research Scheme, it is my privilege and honour to propose a hearty vote of thanks to His Excellency the Governor for so kindly coming here.

"Your very presence here today, Sir, has been the means of drawing this large concourse of people together and we hope it will also largely tend to increase the interest of not only the general public but the villagers and especially the small-holders in our rubber research work.

"Knowing how valuable your time is, Sir, and knowing what an interest Your Excellency takes in all matters pertaining to the welfare of the country, it is hardly necessary for me to say how very much we members of the Board appreciate the coming of Your Excellency to open these buildings which we trust will be of considerable benefit to the rubber industry.

"Though not quite within the terms of the resolution I would like to call Your Excellency's special attention to the work done by the Director and the Estate Committee. These gentlemen are busy men and they have ungrudgingly given their valuable time to the work they set out to do, and you see the results here today. We other members of the Board are very beholden to them.

"I am also very pleased to see my old friend and colleague, the Minister for Agriculture, a man who can do a tremendous lot for us and a man whom we very much admire. There is something I want to tell you, Sir, about him—I know he has some money of ours or at least money which we consider should be ours. I refer to the old restriction fund. If Your Excellency could talk to him in kindly and soothing words and try and wheedle this money out of him for us, we would be eternally obliged.

"There is only one other matter I want to call attention to and that is the import duties on dusting machines and sulphur. We brought this matter up first in May last year in the hope that some decision would be come to before the next wintering season in January, but as far as I know no decision has yet been arrived at. I understand the Minister for Agriculture has approved long ago and I suggest that Your Excellency will kindly on our behalf put a stick of dynamite in the department which is holding the matter up.

The Speaker, I believe, is following me and supporting this resolution. He having what is vulgarly known as the "gift of the gab" will no doubt do much more justice to the resolution than I can."

The Hon. Mr. F. A. Obeyesekere (Speaker of the State Council) in seconding the vote of thanks, said that he desired to associate himself with the vote of thanks just proposed to His Excellency.

Mr. Obeyesekere proceeded to quote the following extract from a speech by Sir (then Mr.) Don Baron Jayatilaka, delivered in the old Legislative Council on December 22nd, 1925: "In 1923-24 the value of raw materials exported from Ceylon amounted to over Rs. 113,000,000, while manufactured articles that were exported amounted ony to about Rs. 3,000,000. This is a matter to which I think not only the Government but the people of the country as a whole ought to direct attention. We are like the people in the wilds of Africa who are content with exporting raw materials to other countries where they are manufactured and the manufactured articles come back to us in most cases, and we pay large sums for them . . . I ask, 'Is this to be our fate for ever ?'' are we going to be for ever the suppliers of raw materials to other countries ? Can we ever hope to see at least some part of the raw material of the country turned into the manufactured article, and the manufactured article exported, giving us a very much larger return than we would get had the raw material been exported ?''

Mr. Obeyesekere added: "We have daily evidence of the unsparing efforts His Excellency has made and is making to keep himself in personal touch with, and in full understanding of, all the important and varied activities the country is occupying itself with in agricultural and industrial development from a time almost synchronising with His Excellency's arrival in this Island. The country has already realised that this constant solicitude evidenced by His Excellency in regard to the efforts made in the country is not mere idle curiosity but that it has already resulted in invaluable constructive suggestion and criticism, welcomed by all sections of the community and valuable to the furtherance of the progress now in being."

In conclusion, Mr. Obeyesekere said: "With the first-hand knowledge so assiduously sought for by His Excellency we may well hope to see His Excellency's régime in Ceylon to be one fraught with unprecedented progress in agricultural and industrial activities." (Applause).

His Excellency, accompanied by the Board members next inspected the factory and afterwards opened and inspected the laboratory.

The buildings were then open to inspection by visitors.

DESCRIPTION OF FACTORY AND LABORATORY AT DARTONFIELD ESTATE *

DARTONFIELD experimental factory is intended to provide facilities for several different purposes, namely:—

(a) Routine manufacture of the estate crop and demonstration of the manufacture of crepe and smoked sheet under model conditions.

(b) Experimental work on the preparation of raw rubber in alternative forms and observations on the efficacy of present methods.

(c) Experimental work on the utilisation of rubber in the local manufacture of certain types of vulcanized products.

The building is approximately 125 ft. long × 65 ft. wide divided into 2 sections by a central packing and store room. One end of the building is equipped for raw rubber manufacture and the other for vulcanization work. The first impression on entering is that the building is light and airy to a degree seldom achieved in Ceylon rubber factories. This is largely due to the special lighting arrangement running the whole length of the building at the apex of the roof, which admits ample reflected daylight while excluding the direct rays of the sun which are harmful to unvulcanized rubber.

The machines throughout the factory are driven electrically and a separate motor is provided for each unit. This arrangement renders it possible to study the power consumption at each stage of machining and also eliminates all overhead shafting with its attendant disadvantages.

Power is supplied by a 52/57 H.P. Ruston Hornsby three cylinder vertical oil engine coupled direct to a 35KW dynamo generating current at 230 volts. Supplementing this is a 9 h.p. Lister single cylinder engine also run in conjunction with a

* As issued to the Press

generator. This unit is useful for battery charging, for lighting and for running the smaller machines when the larger engine is not operating.

While the routine rubber making plant does not differ essentially from the normal equipment used in Ceylon factories, there are certain features that call for brief comment.

Latex is run into the coagulating tanks inside the building from two cememt settling tanks placed on the verandah. There are two coagulating tanks for crepe manufacture, one of which is lined with white tiles while the other has been finished with acid resisting cement. Provision is made for sheet coagulation being done in pans or in a partitioned aluminium tank.

The crepe rolling equipment is in some way rather unusual. The machines are of local design and construction and every part has been strengthened and enlarged to increase the durability of the machines and to make it possible to apply higher pressures. The rollers are 26 inches long and 14 inches in diameter and are internally cooled by water. The smooth rollers are also provided with a steam heating arrangement so that in case of need they can be used as masticating and mixing rollers. For experimental purposes variable speed motors have been installed for driving these machines so that the speed of the rollers may be varied by 50 per cent.

The sheeting plant consists of one smooth mill and one spiral grooved sheeting mill mounted in tandem on a single framework. Each pair of rollers is independently driven by a variable speed motor with V-belt silent drive.

The experimental side of raw rubber production is represented at present by semi-commercial scale apparatus that has been used for the preparation of rubber in crumb form. A small high speed disintegrator breaks up the coagulum into a wet crumb which is then dried in a rotary drier through which air is blown.

The preservation of latex for shipment has long left the experimental stage although Ceylon has so far had little experience in this branch of the industry. The industrial applications of latex, are, however, now so extensive that it seems unlikely that Ceylon estates will remain outside this field of activity. It is one of the aims of the Research Scheme to be in a position to

give estates practical assistance in the technique of latex preservation and to this end an ammoniating tank has been installed at the Dartonfield factory, together with a latex storage tank and an arrangement for emptying this by means of compressed air.

Those who are familiar with the trend of the rubber industry as it affects the utilisation of latex may be surprised at the absence of any means of producing concentrated latex. This is a question that has not been overlooked and it is probable that a latex centrifuge will be installed during the year for experimental purposes.

The purely experimental side of the factory is equipped with small-scale manufacturing and vulcanizing plant for testing the processing properties of raw rubber and for investigating the possibilities of the local production of manufactured goods. The equipment consists of a masticating and mixing mill, a 3-bowl calender, an extruding machine for the production of rubber in continuous lengths, a spreading machine for coating fabrics, a steam vulcanizer and a small steam-heated volcanizing press. The whole plant is arranged so as to facilitate the transference of stock from one machine to another and at the same time to leave a considerable amount of space unoccupied for future developments.

Close to the main factory building is a three-storey drying building. This is divided centrally so that one half is used as a smokehouse and the other as a crepe drying house. The construction of the smokehouse follows the lines recommended by the Rubber Research Scheme and the crepe drying room is heated to a temperature of about 90-95°F by means of a hot water radiator, with a view to eliminating trouble with mould in wet weather.

The laboratory building, which includes the estate superintendent's and chemist's offices, is about 50 yards from the factory. The laboratory itself is equipped for general chemical work with particular reference to the physical and chemical examination of raw and vulcanized rubber. Electric lighting and power are supplied to the laboratory building by the factory generators, but there is a storage battery of 120 cells for use at night and at other times when the factory engines are not running. Gas for the laboratory burners is produced by a petrol-gas plant that operates very effectively with little attention.

For the testing of raw and vulcanised rubber several specially designed pieces of apparatus have been installed. There is, for example, a test which serves to give an indication of the ageing properties of vulcanized rubber. The samples are heated for several days in air at a controlled temperature and the progress of deterioration is followed by determining from time to time the tensile strength. The stress-strain characteristics and tensile strength of the samples are measured by means of an electrically-operated dynamometer.

In another test the deformation of raw rubber under a standard weight is accurately measured and taken as a measure of plasticity, a property that is of great importance to the manufacturer. The viscosity of rubber latex is another variable property for the study of which provision has been made.

It will thus be seen that the factory and laboratory at Dartonfield together form a complete unit for the extension of work on the utilisation of rubber. The provision of these facilities may be taken as an indication of the importance which the Board of the Rubber Research Scheme attaches to this type of work.

RUBBER RESEARCH SCHEME (CEYLON)

Minutes of the Twenty-third Meeting of the Board of Management, held in the Committee Room of the Chamber of Commerce, Colombo, at 10 a.m. on Thursday, October 18, 1934.

Present.—Dr. W. Youngman (in the chair), Messrs. C. H. Collins, C.C.S., (Deputy Financial Secretary), Leo. B. de Mel, J.P., U.P.M., George E. de Silva, M.S.C., W. P. H. Dias, J.P., C. H. Z. Fernando, M.M.C., F. H. Griffith, M.S.C., F. H. Layard, P. R. May, F. A. Obeyesekere, M.S.C., H. F. Parfitt, M.S.C., C. A. Pereira, B. M. Selwyn and Col. T. Y. Wright.

Mr. T. E. H. O'Brien, Director of Research, was also present by invitation.

Apologies for absence were received from Col. T. G. Jayewardene, V.D., M.S.C., and Mr. L. P. Gapp.

MINUTES OF THE TWENTY-SECOND MEETING OF THE BOARD

Draft minutes which had been circulated to members were confirmed and signed by the Chairman.

BOARD

The Chairman welcomed to the Board Mr. W. P. H. Dias, J.P., who had been nominated to act for Mr. C. E. A. Dias, J.P., during his absence from the Island.

DECISIONS BY CIRCULATION OF PAPERS

(a) *Nursery at Dartonfield Estate.*—The Chairman reported that the Board had approved of application being made to the Rubber Controller for permission to plant the nursery. Permission had been obtained under Clause 44 (2) of the Restriction Ordinance and the nursery had been planted.

(b) *Visit of Chemist to Calcutta.*—The Chairman reported that the Board had decided in favour of Mr. M. W. Philpott making a short visit to Calcutta in connection with the treatment of jute woolpacks with latex, as requested by the Rubber Growers' Association. The date of his departure had not been settled.

ESTIMATES OF INCOME AND EXPENDITURE FOR 1935

Draft estimates of income and expenditure for 1935, which had previously been circulated to members were considered. After discussion and minor alterations the following estimates were adopted:

Income				Rs. 163,600
Expenditure recurrent		Rs. 139,792		
,, non-recurrent		,, 27,011	,,	166,803

OIDIUM LEAF DISEASE

After consideration of the present position in regard to the incidence of Oidium leaf disease on local rubber plantations the following resolution was adopted : "That the Hon'ble the Minister for Agriculture be approached to allow a part of the old Restriction Fund to be utilised for the purpose of providing for the expense of dusting rubber areas affected by Oidium by means of dusting machines or aeroplane should one become available". It was further decided to request that a Committee be appointed by Government to investigate the position and to work out a definite scheme for the control of the disease.

Arising from a memorandum by the Director of Research on future experimental work on Oidium it was decided that Mr. R. K. S. Murray, Mycologist and Botanist, should continue to conduct this work and that an Assistant Botanist with a good knowledge of field experimentation should be appointed to take charge of agricultural research at Dartonfield.

It was further decided that a small-holdings officer should be appointed and that Mr. W. I. Pieris, Agricultural Assistant, should be transferred to this post.

The Director of Research was authorised to purchase one sulphur dusting machine of each well-known make up to a total of six for purposes of demonstration and comparison.

The meeting then adjourned and it was decided to arrange for the adjourned meeting to be held at Dartonfield Estate.

RUBBER RESEARCH SCHEME (CEYLON)

Minutes of continuation of the adjourned twenty-third meeting of the Board of Management, held at Dartonfield Estate, Agalawatte, at 10 a.m. on Thursday, November 15, 1934.

Present.—Dr. W. Youngman (in the chair), Messrs. C. H. Collins, C.C.S., (Deputy Financial Secretary), I. L. Cameron, L. B. de Mel, J.P.U.P.M., W. P. H. Dias, J.P., C. H. Z. Fernando, M.M.C., F. H. Griffith, Col. T. G. Jayewardene, V.D., M.S.C., Messrs. P. R. May, F. A. Obeyesekere, M.S.C., H. F. Parfitt, M.S.C., C. A. Pereira, B. M. Selwyn, Col. T. Y. Wright.

Mr. T. E. H. O'Brien, Director of Research, was also present by invitation.

In the absence of Dr. Youngman at the beginning of the meeting Mr. B. M. Selwyn was voted to the Chair. Dr. Youngman took the chair on his arrival.

Apologies for absence were received from Messrs. George E. de Silva, M.S.C., and L. P. Gapp.

BOARD

The Chairman reported that Mr. I. L. Cameron had resumed membership on his return to Ceylon, relieving Mr. F. H. Layard who had been appointed to act for him.

OIDIUM LEAF DISEASE

The Director of Research reported that an Autogiro aircraft would probably be coming to Ceylon for demonstration purposes about the end of the year and he had ascertained that it would be possible to charter the machine for preliminary sulphur dusting experiments. A vote of Rs. 2,000/- for the purpose was approved.

It was decided that the control of Oidium by sulphur dusting should be demonstrated on small-holdings in 3 or 4 centres in mid-country districts during the next refoliation season. A sum of Rs. 1,000/- was voted to cover the expenditure.

The Chairman reported that the question of remission of import duties on sulphur and dusting machines was under consideration by Government. It was also reported that the possibility of sulphur taints in tea, arising from sulphur dusting, was being investigated by the Tea Research Institute.

After consideration of the present arrangements for reporting on proprietary products it was decided that the Director of Research should be permitted to report on sulphur and dusting machines without previous reference to the Board but the Board should be informed of such reports by circulation of papers.

CONDITIONS OF SERVICE OF JUNIOR STAFF

The report of a Committee appointed by the Board, consisting of Messrs. C. H. Collins, F. A. Obeyesekere and F. H. Layard was considered and the recommendations accepted.

ACCOUNTS

(a) Statements of receipts and payments of the Board and of the London Advisory Committee for the quarters ended June 30, and September 30, 1934, were adopted without discussion.

(b) Accounts of Dartonfield Estate and Nivitigalakele for June, July and August were tabled.

ESTATE COMMITTEE

(a) The following matters, arising from minutes of meetings of the Estate Committee held on August 16, September 2 and October 6, 1934 were considered.

1. *Formal opening of Buildings at Dartonfield.*—It was decided to invite His Excellency the Governor to open the buildings on a date in February next.*

2. *Approach road to Dartonfield.*—It was decided to accept the terms recommended by the Estate Committee in respect of the use of the Galawatte Estate cart-road. These provide for (a) responsibility for upkeep of the road to be taken over by Dartonfield Estate, (b) cost of upkeep to be shared equally between the two estates, provided that the annual cost to Galawatte Estate does not exceed the average expenditure of the past 5 years. (c) Cost of improvements or alterations required by the Board to be paid by Dartonfield Estate.

3. *Manuring at Nivitigalakele.*—A vote of Rs. 750/- was approved for manuring backward areas during the current year.

4. *Extension of Nivitigalakele.*—The Chairman reported that the application for 100 acres of Crown land at Nivitigalakele was under the consideration of Government and that an early decision could be expected.† In the event of the land being allocated, the Director of Research was authorized to clear 32 acres this season, of which 25 acres would be utilised for clone testing etc., and 7 acres for budwood multiplication and seedling nurseries.

5. *Experimental Factory.*—A vote of Rs. 505/- was approved for the installation of automatic water sprinklers in the smoke-house.

(b) *Personnel of Estate Committee.*—Mr. I. L. Cameron was appointed to serve on the Estate Committee and Messrs. P. R. May and F. A. Obeyesekere were appointed to act during the absence of Messrs. E. W. Whitelaw and J. L. Kotalawala.

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* His Excellency has agreed to open the buildings at 3 p.m. on February 25, 1935.

† Government has since agreed to lease 100 acres for experimental purposes.

LONDON ADVISORY COMMITTEE

The provisional decision, which was made at the meeting held on July 19th, to extend the contribution to the expenditure of the London Advisory Committee up to the end of 1935 pending the consideration of a new Scheme, was confirmed and the Chairman was authorized to remit the necessary funds to the Committee. It was decided to ask that the Board should be consulted in regard to filling future vacancies which occur in the Committee.

BUNGALOWS AT DARTONFIELD

The Estate Committee was asked to submit estimates for the installation of electric light and septic tank drainage at the Superintendent's bungalow and for providing heavy furniture in the Superintendent's and Junior Staff bungalows.

PUBLICATIONS

Second Quarterly Circular for 1934 and reprints of two reports on Oidium were tabled.

RUBBER RESEARCH SCHEME (CEYLON)

Minutes of the twenty-fourth meeting of the Board of Management held at the Grand Oriental Hotel, Colombo, at 10 a.m. on Thursday, January 17, 1935.

Present.—Dr. W. Youngman (in the chair), Messrs. C. H. Collins, C.C.S. (Deputy Financial Secretary), I. L. Cameron, L. B. de Mel, J.P., U.P.M., W. H. P. Dias, J.P., George E. de Silva, M.S.C., C. H. Z. Fernando, M.M.C., F. H. Griffith, L. P. Gapp, H. F. Parfitt, M.S.C., C. A. Pereira, B. M. Selwyn, E. W. Whitelaw, and Colonel T. Y. Wright.

Mr. T. E. H. O'Brien, Director of Research, was also present by invitation.

Apology for absence was received from Col. T. G. Jayewardene. V.D., M.S.C.

MINUTES OF CONTINUATION OF THE ADJOURNED 23RD MEETING OF THE BOARD

Draft minutes which had been circulated to members were confirmed and signed by the Chairman.

BOARD

The Chairman reported that Mr. E. W. Whitelaw had resumed membership on his return to Ceylon and thanked Mr. P. R. May for his services in acting for Mr. Whitelaw.

OFFICIAL OPENING OF DARTONFIELD BUILDINGS

The Chairman reported that His Excellency the Governor had agreed to open the buildings at 3 p.m. on February 25th. It was decided to leave details of the arrangements in the hands of the Chairman of the Board and of the Estate Committee.

OIDIUM LEAF DISEASE

The Chairman reported that he had not yet heard from the Ministry of Agriculture in regard to the Board's proposal for the appointment of a Government Committee. It was decided that a deputation consisting of the Chairman, Mr. H. F. Parfitt and Mr. G. E. de Silva should wait on the Executive Committee for Agriculture and Lands to explain the position and impress on them the urgent need of funds for the control of oidium. It was also mentioned that an early decision was hoped for in regard to the exemption of sulphur dust and dusting machines from import duty.

APPOINTMENT OF ASSISTANT BOTANIST

The recommendations of the Sub-Committee in regard to salary and terms of appointment, were approved and the Chairman was authorized to advertise the vacancy locally and in England.

ACCOUNTS

(a) The Chairman reported the renewal of four fixed deposits totalling Rs. 95,000. After a discussion on alternative forms of investment of surplus funds it was decided to continue to place such funds on fixed deposit.

(b) Dartonfield and Nivitigalakele accounts for August, September and October were tabled.

STAFF

(a) It was decided that the Director of Research should be permitted to continue to serve on the Budded Rubber Assessment Board during 1935.

(b) The appointment of four junior officers was reported.

TECHNICAL REPORTS

Monthly reports of the Director of Research were considered and adopted.

LONDON ADVISORY COMMITTEE

Minutes of meetings of the London Advisory Committee for Rubber Research (Ceylon and Malaya) and of the Technical Sub-Committee held on October 26th, 1934 were considered. In regard to a suggestion that strains of Hevea resistant to oidium leaf disease, should be developed it was reported that careful observations by the Mycologist over a number of years do not suggest that individual trees are immune to oidium except so far as wintering occurs at a time when the disease is inactive. The minutes were adopted.

DARTONFIELD ESTATE

(a) Supplementary votes totalling Rs. 13,386·15 were approved to meet capital expenditure in connection with completion of factory, replacement of ceiling boards by asbestos sheeting in new bungalow specifications, electric light and drainage for Superintendent's bungalow, furniture for bungalows, construction of dispensary, extension of cart road.

(b) The Chairman reported that Government had agreed to lease 100 acres of land at Pinnagoda, adjacent to Nivitigalakele. The land had been occupied and approximately 30 acres was being cleared for planting in 1935.

PUBLICATIONS

(a) Combined 3rd and 4th Quarterly Circular for 1934 was tabled. A printer's error in a table on page 82 was reported and it was stated that an erratum slip was being prepared for circulation.

(b) It was decided that a revised edition of the Scheme's handbook on budding, should be prepared.

RUBBER RESEARCH SCHEME (CEYLON)

Minutes of the twenty-fifth meeting of the Board of Management held in the Committee Room of the Chamber of Commerce, Colombo at 10 a.m. on Thursday, March 14, 1935.

Present.—Dr. W. Youngman (in the chair), Messrs. C. H. Collins, C.C.S. (Deputy Financial Secretary), I. L. Cameron, L. B. de Mel, J.P., U.P.M., C. E. A. Dias, J.P., George E. de Silva, M.S.C., F. H. Griffith, Col. T. G. Jayewardene, V.D., M.S.C., Messrs. J. L. Kotalawala, M.S.C., L. P. Gapp, the Hon'ble Mr. F. A. Obeyesekere, M.S.C., Messrs. C. A. Pereira, B. M. Selwyn, E. W. Whitelaw, Col. T. Y. Wright.

Mr. T. E. H. O'Brien, Director of Research, was also present by invitation.

MINUTES OF TWENTY-FOURTH MEETING

Draft minutes which had been circulated to members were confirmed and signed by the Chairman.

BOARD

(a) The Chairman reported the following changes in membership since the last meeting:—

1. Mr. J. L. Kotalawala, M.S.C., renominated to represent the State Council for a further period of three years, from January 22, 1935.

2. Mr. C. E. A. Dias, J.P., resumed his seat from February 2nd, 1935, relieving Mr. W. P. H. Dias, J.P., who had acted for him.

3. The Hon'ble Mr. E. C. Villiers, M.S.C., nominated to represent the State Council with effect from 4th March, 1935, in place of Mr. H. F. Parfitt, M.S.C., who had resigned.

(b) It was decided to invite the Director of Commercial Intelligence to be present at Board meetings when any item of special interest to him is to be discussed.

OFFICIAL OPENING OF BUILDINGS AT DARTONFIELD

(a) *Vote of Thanks to H. E. Sir R. E. Stubbs.*—Col. T. Y. Wright moved that the Board record a vote of thanks in its minute book to His Excellency Sir R. E. Stubbs for visiting Dartonfield and opening the buildings. The Hon'ble Mr. F. A. Obeyesekere seconded.—Carried.

(b) A supplementary vote to cover expenses incurred in connection with the opening ceremony, was approved.

A vote of thanks was passed to the Chairman and the Estate Committee for carrying out so satisfactorily the arrangements for the opening.

ACCOUNTS

(a) Items of expenditure in excess of estimates for 1934 were considered and approved.

(b) Statement of Accounts and Balance Sheet for 1934 together with the Auditor-General's Report, were adopted.

In the course of discussion on the financial position of the Research Scheme a suggestion was made that work on new uses for rubber should be extended. It was decided that the question should be further reviewed when experimental work at Dartonfield factory has been in progress for 6 months. It was reported that attention is being given to the possible local utilisation of scrap rubber and also to the production of cheap flooring material and waterproof fabrics.

(c) Rates of depreciation on buildings and equipment were revised in accordance with recommendations of the Deputy Financial Secretary.

(d) Nivitigalakele and Dartonfield accounts for November and December were tabled.

(e) The Chairman reported the renewal of fixed deposits totalling Rs. 30,000/- and a new deposit of Rs. 30,000/-.

ANNUAL REPORT FOR 1934

The Chairman invited comments on the annual report which had been circulated to members. The report was adopted after discussion on the desirability of publishing early records of the yields of clones under test tapping.

OIDIUM LEAF DISEASE

A Committee consisting of Messrs. E. W. Whitelaw, R. K. S. Murray and T. E. H. O'Brien (Convener) was appointed to prepare a scheme for the control of oidium and report to the Board not later than June 1st.

STAFF

(a) A Selection Committee consisting of the Chairman, the Hon'ble Mr. F. A. Obeyesekere, M.S.C., and Mr. B. M. Selwyn, with the Director of Research in an advisory capacity, was appointed to consider applications for the post of Assistant Botanist and report to the Board at the next meeting. The Committee was also asked to report on the possibilities of training young Ceylonese Scientists for appointments in the Research Scheme.

(b) The Chairman reported that Mr. W. I. Pieris' present engagement would terminate on May 31st. It was decided to re-engage Mr. Pieris for a period of four years as Small-Holdings Officer. It was also decided that the officer should be sent to Malaya for a period of 6-8 weeks to study Small-holdings work there before taking up these duties in Ceylon.

RUBBER RESEARCH SCHEME (CEYLON)

LIST OF PUBLICATIONS FOR SALE.

Bulletins No. 1-20. Bound volume **Rs. 5-00. Later Bulletins Re. 1-00** per copy

No. 1. The Effect of Tapping on the Movements of Plant-Food in Hevea brasiliensis.
No. 2. The Effect of Tapping on the Movements of Plant-Food in Hevea brasiliensis.
No. 3. Seasonal Variations in the Movements of Plant-Food in Hevea brasiliensis Part I.
No. 4. The Physiological Effects of Various Tapping Systems, Part I.
No. 5. Progress Report on Vulcanization Tests
No. 6. The Physiological Effects of Various Tapping Systems, Part II.
No. 7. Do Do Do Part III
No. 8. Seasonal Variations in the Movements of Plant-Food in Hevea brasiliensis, Part II.
No. 9. Vulcanization Tests.
No. 10. Do.
No. 11. Variability in Rubber Manufacture.
No. 12. Progress Report of the Rubber Research Chemist.
No. 13. Vulcanization Tests.
No. 14. On the Variation in the Number of Latex Vessels present in Hevea brasiliensis.
No. 15. Vulcanization Tests.
No. 16. On the Natural Clotting of Rubber Latex.
No. 17. Vulcanization Tests.
No. 18. Measurements of "Bark Renewal."
No. 19. Vulcanization Tests.
No. 20. Do.
No. 21. Do.
No. 22. Do.
No. 23. Do.
No. 24. Do.
No. 25. Investigations on Samples of Plantation Para Rubber from Ceylon.
No. 26. Results of Trials of Ceylon Plantation Rubber for the manufacture of Ebonite.
No. 27. Investigations on Samples of Plantation Para Rubber from Ceylon.
No. 28. Do.
No. 29. Summary of the Principal Results obtained from Investigations into the Properties of Ceylon Plantation Rubber in relation to its Method of Preparation.
No. 30. The penetration of disinfectant on the tapping cut of Hevea brasiliensis.
No. 31. On the Occurrence of "Rust" on Sheet Rubber.
No. 32. On the Preservation of Latex.
No. 33. Investigations on Samples of Plantation Para Rubber from Ceylon.
No. 34. Do.
No. 35. Do.
No. 36. Do.
No. 37. Do.
No. 38. Do.
No. 39. Do. (Final Report Series I.)
No. 40. Do Series II.
No. 41. Do. First Interim Report on artificial ageing tests.
No. 42. On the Smoking of Sheet Rubber in relation to Mould Prevention.
No. 43. The inter-relationship of Yield and the various Vegetative Characters in Hevea brasiliensis. (out of print).
No. 44. The Construction of Smokehouses for Small Rubber Estates. (out of date).
No. 45. The Efficiency of Disinfectants and Fungicides.
No. 46. The Control of Bark Rot by Disinfectants.
No. 47. Report on Variability of Ceylon Estate Grades.
No. 48. Brown Bast and its Treatment.
No. 49. Report on Causes of Variation in Plasticity.
No. 50. Crepe Rolling.
No. 51. The Curing of Sheet Rubber.
No. 52. The Preparation of Uniform Rubber.

Booklets at Rs. 2-50 per copy.

Guide to the Preparation of Plantation Rubber, by T. E. H. O'Brien, M.Sc., A.I.C., Chemist.

The Budding of Rubber, by R. A. Taylor, B.Sc., Physiological Botanist. (out of date).

Diseases of Rubber in Ceylon, by R. K. S. Murray, A.R.C.Sc., Mycologist.

Copies of the following publications of the Rubber Research Institute of Malaya are available at the prices indicated:—

Planting Manual No. 4—Latex Preservation and Shipment **Rs. 3-50.**
Do No. 5—The History and Description of Clones of Hevea Brasiliensis **Rs. 5-00.**
Do No. 6—The Uses and Control of Natural Undergrowth on Rubber Estates **Rs. 2-50.**